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Taxonomic study of Korean Sericinae (Melolonthidae, Coleoptera) II, - Genus *Maladera* -

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Abstract A taxonomical review on 23 species belong to genus *Maladera* recorded from Korean Peninsula was carried out. Eight species of them should be excluded from Korean fauna, due to the previous misidentification, and 2 species, *M. castanea, M. secreta*, out of them are doubtful distribution in Korea. According to the external morphology and male aedeagus, 9 out of 15 recognized species are grouped into 3 difference complex as follows; *M. holosericea* complex: *M. holosericea, M. schoenfeldti, M. renardi; M. orientalis* complex: *M. cariniceps, M. orientalis, M. fusania; M. verticalis* complex: *M. castanea, M. verticalis, M. ovatula.*

Key words Coleoptera, Melolonthidae, *Maladera*, Korea, taxonomy.

INTRODUCTION

Twenty six species of genus *Maladera* have been reported in Korea since by Kolbe (1886), but three species were already synonymized (Nomura, 1967). Eight species of 23 species seems to be misidentified or wrongly cited by previous authors, due to similarities of the external feature. Therefore we have reviewed Korean *Maladera* and traced their phylogenetic relationships based on external characters.

Observed specimens in this study are based on collections of the following organizations: Sungshin Women's Univ., Seoul; Korea Univ., Seoul.; Gyeongsang Univ., Jinju; Yeungnam Univ., Kyungsan, and Hungarian Natural History Museum, Budapest, Hungary. Diagnostic characters of each species are mentioned in the key. And figures are taken with SEM (JSM-5300LV, JEOL). The localities inscribed to "-K" or "-C" for "-Kun" or "-City" were used respectively and the abbreviation of the provinces are used as follows: CB: Ch'ungch'ŏngbukdo, CJ: Chejudo, CN: Ch'ungch'ŏngnamdo, HB: Hamkyŏngbukdo, HH: Hwanghaedo, HN: Hamkyŏngnamdo, JB: Chŏllabukdo, JN: Chŏllanamdo, KB: Kyŏngsangbukdo, KS: Kyŏnggido & Seoul, KN: Kyŏngsangnamdo, KW: Kangwŏndo, PB: Pyŏnganbukdo, PP: Pyŏngan-namdo & Pyŏngyang

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SYSTEMATICS

Genus *Maladera* Mulsant, 1871 알모양우단풍뎅이屬(新稱)

Maladera Mulsant, 1871, Hist. Nat. Col. Fr. Lamellic.: 599. Type : *Scarabaeus holosericea* Scopoli, 1772.

Aserica Lewis, 1895, Ann. Mag. Nat. Hist., (6) XVI: 394. Type : *Autoserica Secreta* Brenske, 1897.

Autoserica Brenske, 1897, Berl. Ent. Zeit.: 377. Type : *Serica piceorufa* Fairmaire, 1888.

Genus *Maladera* characterized with an oval, convex, yellowish brown to black, non-shining velvet-like dorsal surface, but some species with pearly shining. Antenna composed of 9-10 joints including 3 jointed club in both sexes. The length between each mid coxa is same with or longer than width of mid femur. Male aedeagus is variable form such as bilateral symmetry or non-symmetry, joining middle piece and paramere with or without articulation, dividing paramere into right and left or upper and lower part and closed or opened at the end. And the subgenus *Eumaladera* have 10 jointed antenna, longitudinal serrated hind tibia at outer side and a transversal row of bristles at each abdominal sternite. One species of this subgenus was recorded from Korea, but according to our review, this was revealed as mistake. Actually, 4 genera or subgenera were recorded from Korea. But they were revised to the synonyms of *Maladera* (*Maladera*) and all Korean species belong to this subgenus.

Twenty three species except 3 synonymized are recorded from Korea, but 8 of them could not be accepted as the Korean fauna, and other two are doutful. Nine species of Korean *Maladera* are grouped into 3 complex as follows: *M. holosericea* complex (*M. holosericea, M. schoenfeldti, M. renardi*); *M. orientalis* complex (*M. cariniceps, M. orientalis, M. fusania*); *M. verticalis* complex (*M. castanea, M. verticalis, M. ovatula*).

Key to the Korean species of the genus *Maladera*

1(16). Dorsal surface velvet-like. Antenna 9 to 10-joints.

2(3). Clypeus wrinkled by punctuations, with a roundly elevation at the middle. Antenna 10-joints. Hind femur flat, anterior margin finely serrated, length 2.5 times of its breadth. L: 9.0~11mm, W: 6.0~7.0mm. ····· *secreta* (Brenske)

3(2). Clypeus with coarse punctuation sparsely, without elevation. Antenna 9 to 10-joints, antennal club same stem in male. Hind femur wide, without shining, anterior margin not serrated. L: 9.0~10.5 mm, W: 5.5~6.5mm. ····· *infuscata* (Moser)

4(9). Body elongate-oval. Antenna 10-joints, antennal club longer than stem in male. Male aedeagus almost bilateral symmetry, middle piece elongate, with a process at the end, articulated with paramere, paramere with or without process. ····· *holosericea* complex

5(8). Antennal club longer than twice of stem in male, shorter than stem in female.

6(7). Body slender and long. Hind femur slender and long. Length of spur in the hind tibia shorter than the 1st tarsal segment. Each paramere with a little process on the tip (fig. 1). L: 7.0~9.0mm, W:

4.0~5.0mm. ..... *holosericea* (Scopoli)

7(6). Body long. Hind femur wide. Length of spur in the hind tibia same the 1st tarsal segment. Left paramere with a little process on the tip (fig. 2). L: 7.0~9.2mm, W: 4.2~5.3mm. ..... *schoenfeldti* (Murayama)

8(5). Antennal club longer than stem in male, same stem in female Left paramere with a process on the middle (fig. 3). L: 6.5~9.2mm, W: 4.5~6.0mm. ..... *renardi* (Ballion)

9(4). Body oval. Antenna 9 to 10-joints, antennal club same stem in male. Basal piece and middle piece elongate, left middle piece longer than right. paramere with or without process. ..... *orientalis* complex

10(13). Antenna 9-joints. Breadth of pronotum shorter than twice of its length.

11(12). Vertex with a transversal row of bristles. Elytra wide at the backward, length of elytra 1.4 times of its breadth. Attached region of middle piece and paramere rolled (fig. 4). L: 9.0~10.0mm, W: 5.5~6.0mm. ..... *cariniceps* (Moser)

12(11). Vertex without a transversal row of bristles. Elytra wide at the backward slightly, length of elytra 1.5-1.7 times its bredth. Attached region of middle piece and paramere not rolled, left paramere with a small process (fig. 5). L: 6.0~9.0mm, W: 3.5~5.5mm. ..... *orientalis* (Motschulsky)

13(10). Antenna 10-joints. Breadth of pronotum longer than twice of its length. Elytra wide at the backward greatly, length of elytra 1.2 times of its breadth. Left paramere without a process (fig. 6). L: 7.5~10.2mm, W: 5.0~6.0mm. ..... *fusania* (Murayama)

14(15). Dosal surface without deeply oval puntuations. Antennal club same or longer than twice of stem in male. 3rd abdominal sternite distinctly elevate in the middle. Parameres curved strongly(fig. 7). L: 9.0~12.0mm, W: 5.6~8.0mm. ..... *gibbiventris* (Brenske)

15(14). Dosal surface with deeply oval puntuations. Length of male antennal club longer than stem and shorter than twice of stem. 3rd abdominal sternite not elevate. Left paramere flat, right paramere niddle-shaped (fig. 8). L: 8.0~10.5mm, W: 4.5~6.5mm. ..... *okamotoi* (Murayama)

16(1). Dorsal surface not velvet-like, shinning or pearly shinning. Antenna 10-joints.

17(24). Each lateral side of pronotum with one black pattern. Hind femur wide.

18(23). Body brown to dark brown, dorsal surface with bristle rarely. Antennal club same, shorter or longer than stem in male. Inner side of mid tibia without setae in male (fig. 12). Basal piece very short, middle piece long cylinder form, parameres consist of upper and lower parts. ..... *verticalis* complex

19(22). Body same or longer than 8.0mm.

20(21). Vertex with yellowish brown bristles. Pygidium with a median line clearly. Upper paramere long and narrow. L: 9.0~10.0mm, W: 5.0~6.0mm. ..... *castanea* (Arrow)

21(20). Vertex without bristle. Pygidium with a median line not clearly. Upper paramere short and wide (fig. 9). L: 8.0~9.2mm, W: 4.3~6.0mm. ..... *verticalis* (Fairmaire)

22(19). Body shorter than 8.0mm. Suture of clypeus mountainous. Upper paramere semicircular, long, narrow (fig. 10). L: 7.0~8.0mm, W: 4.5~5.1mm. ..... *ovatula* (Fairmaire)

23(18). Body yellowish brown, dorsal surface with yellowish brown bristles sparsely. Antennal club same with stem in male. Inner side of mid tibia with many setae in male (fig.13). Between left and right

paramere with long niddle shaped process(fig. 13). L: 7.0~8.7mm, W: 4.0~5.0mm. ..... *aureola* (Murayama)

24(17). Each lateral side of pronotum without one black pattern. Hind femur narrow. Hind tibia short and flat. L: 8.8mm, W: 5.0~5.5mm. ..... *opaciventris* (Moser)

Maladera secreta (Brenske, 1897) 제주우단풍뎅이

Autoserica secreta Brenske, 1897, Berl. Ent. Zeit., XLII: 431; Okamoto, 1924: 173.

Aserica secreta; Murayama, 1938a: 12; Miwa et Chûjô, 1939: 57.

Serica secreta; Murayama, 1954: 35; Cho, 1963: 218; Cho, 1968: 264; Cho, 1969: 651; Lee et al., 1985: 421.

Maladera secreta; Kor. Soc. Pl. Protect., 1972: 207; Ent. Kor. Soc., 1994: 151.

Korean name. 제주우단풍뎅이 (6 reports after Cho, 1963).

Distribution. Korea (Chejudo), Japan, Taiwan.

Remarks. The specimen was recorded with a single specimen from Chejudo by Okamoto (1924), but we have not found Korean one.

Maladera infuscata (Moser, 1915) 그을음빛우단풍뎅이

Autoserica infuscata Moser, 1915, Deut. Ent. Zeit.: 340, Niijima et Kinoshita, 1923: 29; Niijima et Kinoshita, 1927: 6; Murayama, 1935b: 329.

Aserica infuscata; Murayama, 1938a: 13 (Mokp'o, 1935, 2우 우; Tongnae, IV. 1926, 1우; Koryŏng, 4-5. VII. 1935); Miwa et Chûjô, 1939: 56; Cho, 1957: 297.

Serica infuscata; Murayama, 1954: 41 (Wangshimri, 1935, 2우 우); Cho, 1969: 653; Kim et Nam, 1982: 154.

Maladera (M.) infuscata: Nomura, 1974: 104; Stebnicka, 1980: 207.

Korean name. 그을음빛우단풍뎅이 (2 rep. after Kor. Zool. Soc., 1968), 그을음우단풍뎅이 (Ent. Kor. Soc., 1994).

Larvae. Sun et Zhang (1982).

Distribution. Korea (Central, South, Chejudo), Japan, Taiwan, China.

Remarks. No specimen has been found, and it probably a rare species in Korea.

Maladera holosericea (Scopoli, 1772) 홀쭉우단풍뎅이

Scarabaeus holosericea Scopoli, 1772, Ann. Hist. Nat. V: 77.

Serica holosericea; Murayama, 1935a: 2; Murayama, 1937: 33; Murayama, 1938a: 10; Murayama, 1941: 19; Murayama, 1954: 52; Cho, 1969: 656; Kim et al., 1974: 229.

Maladera holosericea; Miwa et Chûjŏ, 1939: 54; Kim et Yoo, 1987: 505; Kim et Lee, 1991: 67; Kim,

1992: 105.

Maladera holoserica [sic]; Cho, 1957: 124.

Serica holoserica [sic]; Kim et Nam, 1982: 154.

Maladera (M.) holosericea; Stebnicka, 1980: 255.

Korean name. 긴우단풍뎅이 (2 rep. after Kor. Zool. Soc., 1968), 홀쭉(쭉)우단풍뎅이 (4 rep. after Cho, 1969).

Examined specimens (55exs.). PP: P'yŏngyang, Mt. Myohang, KW: Mt. Kŭmgang, Mt. Sŏrak, Ch'unch'ŏn-C, Kangch'ŏn, KS: Yŏnch'ŏn-K, Mt. Ch'ŏnggye, Mt. Aengmubong, Namhansansŏng, Mt. Ch'ŏnma, Hwasŏng-K, Sŏngnam, P'och'ŏn-K, Mt. Tobong, Seoul-C, CN: Mt. Kyeryong, KN: Ŭiryŏng-K, Ulchu-K.

Monthly collection. 55exs. IV: 1, V: 20, VI: 26, VII: 7, IX: 1ex.

Distribution. Korea (North, Central, South), Manchuria, Amur, Caucasus, Europe.

Maladera schoenfeldti (Murayama, 1937) 스웬헬드트우단풍뎅이

Serica schönfeldti Murayama, 1937, J. Chosen Nat. Hist. Soc., 22: 33, Murayama, 1938a: 11; Murayama, 1954: 56; Cho, 1969: 657; Kim et Nam, 1982: 154.

Serica schoenfeldti; Miwa et Chûjŏ, 1939: 54; Cho, 1969: 295.

Maladera (M.) schonfeldti; Stebnicka, 1980: 258.

Maladera schönfeldti; Kim et Lee, 1991: 67.

Korean name. 센펠트우단풍뎅이 (1 rep. after Kor. Zool. Soc., 1968), 펠트우단풍뎅이 [sic] (Kim et Lee, 1991), 스엔헬드트우단풍뎅이 (Cho, 1969), 스웬헬드트우단풍뎅이 (Ent. Kor. Soc., 1994).

Examined specimens (14exs.). KW: Mt. Ch'iak, KS: Mt. Ch'ŏnggye, Mt. Ch'ŏnma, Mt. Yongmun, P'aju-K, Suwon, Namhansansŏng, Mt. Tobong, Seoul-C.

Distribution. Korea (North, Central, South).

Maladera renardi (Ballion, 1870) 레나아드우단풍뎅이

Serica renardi Ballion, 1870, Bull. Soc. Nat. Hist. Moscou., XLIII: 339; Murayama, 1935a: 2; Murayama, 1937: 33; Murayama, 1938a: 11; Murayama, 1941: 19; Murayama, 1954: 54; Sawada, 1937: 9; Cho, 1969: 657; Kim et Kim, 1972a: 84; Kim et Nam, 1982: 154.

Serica motschulskyi; Brenske, 1897: 370; Dalla Torre, 1912: 13 (*Motschulskyi*); Niijima et kinoshita, 1923: 22; Winkler, 1925: 1069; Saito, 1928: 13; Kato, 1935: 112; Murayama, 1937: 43; Murayama, 1938a: 11; Murayama, 1954: 58; Sawada, 1937: 9; Mochizuki et al., 1937: 93; Miwa et Chûjô, 1939: 53; Cho, 1957: 295; Cho, 1969: 658; Kim et Kim, 1972a: 53; Kim et Nam, 1982: 155.

Serica spissigrada Brenske; Niijima et Kinoshita, 1923: 23; Saito, 1928: 13; Sawada, 1937: 29; Muraryama, 1938a: 12; Murayama, 1941: 19; Murayama, 1954: 40; Nomura, 1967: 52; Cho,

1969: 652; Kim et. Nam., 1982: 154.

Serica nakayamai Murayama, 1938a: 16; Murayama, 1941: 19; Murayama, 1954: 57; Cho, 1969: 658; Kim et Kim, 1972a: 83; Kim et Nam, 1982: 155.

Maladera renardi; Miwa et Chûjô, 1939: 55; Cho, 1957: 124; Kim, 1983: 83; Kim et Lee, 1991: 67; Kim, 1992: 105; Kim et al., 1994: 111; Bae et Moon, 1993: 147.

Maladera spissigrada; Miwa et Chûjô, 1939: 55; Cho, 1957: 296; Kim, 1981: 344.

Maladera (M.) renardi; Nomura, 1967: 52; Nomura, 1973: 128; Stebnicka, 1980: 254.

Korean name. 레나아드우단풍뎅이 (5 rep. after Kor. Zool. Soc., 1968), 레나르디우단풍뎅이 (Cho, 1969)

Examined specimens (18exs.). PB: Mt. Myohyang, PP: Pyŏngyang, KW: Ch'unch'ŏn-C, KS: Namyangju-K, Seoul-C, CN: Mt. Kyeryong, KB: Mt. Chuwang, Koryŏng-K.

Distribution. Korea (North, Central, South), Japan, Manchuria, North China, East Siberia.

***Maladera cariniceps* (Moser, 1915) 알모양우단풍뎅이**

Autoserica cariniceps Moser, 1915, Deut. Ent. Zeit.: 341; Niijima et Kinoshita, 1923: 238; Niijima et Kinoshita, 1927: 7.

Aserica cariniceps; Winkler, 1925: 1070; Murayama, 1938a: 13; Miwa et Chûjŏ, 1939: 55; Cho, 1957: 124.

Aserica fusania Murayama; Nomura, 1967: 52.

Serica cariniceps; Murayama, 1954: 41; Cho, 1969: 653; Kim et Nam, 1982: 155.

Maladera (Aserica) cariniceps; Nomura, 1967: 52.

Maladera (M.) cariniceps; Nomura, 1973: 133; Stebnicka, 1980: 255.

Maladera cariniceps; Kim et Lee, 1991: 67; Kim, 1992: 105.

Korean name. 오카우단풍뎅이 (3 rep. after Kor. Zool. Soc., 1968), 알모양우단풍뎅이 (1 rep. after Cho, 1969)

Examined specimens (141exs.). KW: Tonghae-C, KS: Iryŏng, Nanhansansŏng, Mt. Ch'ŏnma, Puch'ŏn-C, Kwangju-K, Kwangnŭng, Kwach'ŏn, P'aju-K., Ongjin-K, Suwon, Kanghwa, Seoul-C, CB: Ch'ungju, Ch'ŏngju, Koesan-K., CN: Mt. Kwangdŏk, Mt. Keyryong, Tangjin-K, Choch'iwŏn, Sŏsan-K, JB: Koch'ang-K, Puan-K, Namwon, JN: Kwangyang, Mt. Chiri, Mt. Paekun, Mt. Chogye, Mokp'o, KB: Mt. Hwanghak, Andong, Koryŏng, Kyŏngsan, Yŏngju, KN: Temp. Haeinsa.

Monthly collection. 141exs. IV: 14, V: 70, VI:37, VII: 11, VIII: 3, IX: 6exs

Distribution. Korea (North, Central, South), Japan, Manchuria.

***Maladera orientalis* (Motschulsky, 1857) 애우단풍뎅이**

Serica orientalis Motschulsky, 1857, Etud. Ent., VI: 33; Kolbe, 1886: 192; Niijima et Kinoshita, 1923: 238; Okamoto, 1924: 172; Nakayama, 1929: 266; Nakayama et Okamoto, 1940: 200; Murayama,

1931: 20; Murayama, 1938a: 10; Murayama, 1938b: 259; Murayama, 1941: 18; Murayama, 1954: 48; Masaki, 1936: 261; Sawada, 1937: 25; Mori et al., 1937: 93; Cho, 1957: 295; Cho, 1963: 217; Cho, 1967: 197; Cho, 1968: 264; Cho, 1969: 655; Kim et Kim, 1972a: 84; Kim et Kim, 1972b: 196; Kim et al., 1974: 229; Kim et Kim, 1974: 107; Kim et Nam, 1982: 154; Kim et al., 1984: 328; Lee et al., 1985: 421.

Maladera orientalis; Dalla Torre, 1912: 18; Winkler, 1925: 1070; Kim, 1981: 344; Kim et Chang, 1987: 104; Kim et Yoo, 1987: 505; Kim, 1989: 365, 381; Kim et Lee, 1991: 67; Kim et Park, 1991: 192; Kim et al., 1991: 192; Kim, 1992: 105; Kim et al., 1994: 111; Kim et al., 1995: 455; Park et al., 1993: 178.

Serica salebrosa Brenske; Masaki, 1936: 261.

Maladera (*M.*) *orientalis*; Stebnicka, 1980: 257.

Korean name. 동양우단풍뎅이 (1 rep. after Cho, 1963), 애우단풍뎅(덩)이 (21 rep. after Cho, 1967).

Examined specimens (about 470exs.). HN: Wonsan, PP: Mt. Myohyang, Pyŏngyang, River Taedong, Sariwŏn, KW: Mt. Kŭmgang, Mt. Sŏrak, Mt. Ch'iak, Wonju-C, Ch'unch'ŏn-C, Kosŏng-K, Hongch'on-K, P'yŏngch'ang-K, Samch'ŏk, Kangnŭng, Mt. T'aebaek, KS: Kesŏng, Mt. Yumyŏng, Mt. Ch'ungnyŏng, Mt. Ch'ŏnma, Mt. Ch'ŏnggye, Mt. Soyo, Mt. Wangbang, Mt. Surak, Mt. Kwanak, Yongin-K, Kap'yŏng-K, P'aju-K, P'och'ŏn-K, Namyangju-K, Yangp'yŏng-K, Suwon, Inch'ŏn, Yŏju, Ich'ŏn, Shiŭng, Yŏnch'ŏn-K, Seoul-C, CB: Ŭmsŏng-K, Mt. Kayŏp, Mt. Songni, Mt. Worak, Koesan-K, Ch'ungju, Ch'ŏngju, Tanyang, CN: Choch'iwŏn, Nonsan-K, Ch'ŏnan, Asan-K, JB: Mt. Tŏkyu, Mt. Naejang, Mt. Chiri, Puan -K., Muju-K, JN: Mt. Paekun, Mt. Paekyang, Posŏng-K, Haenam-K, Kwangju-C, Mokp'o-C, Yŏsu, Is. Chindo, KB: Mt. Sobaek, Mt. Chuwang, Mt. Hwanghak, Mt. Unmun, P'ohang-C, Taegu, Ch'ŏngsong-K, Andong-K, Kyŏngsan-C, Koryŏng, Kyŏngju-C, KN: Is. Kŏje, Samch'ŏnp'o, Hapch'ŏn-K, Chinju-C, Tongrae, CJ: Hallim.

Monthly collection. 464exs. IV: 46, V: 223, VI: 174, VII: 15, VIII: 2, IX: 2, X: 2exs.

Distribution. Korea (the whole country), Japan, Taiwan, China, Sahalin, Manchuria, Mongolia.

Maladera fusania (Murayama, 1934) 부산우단풍뎅이

Aserica fusania Murayama, 1934, J. Chosen Nat. Hist. Soc., 19: 35 (Pusan); Murayama, 1935a: 3; Murayama, 1938a: 13; Nomura, 1967: 52.

Serica fusania; Murayama, 1954: 38; Cho, 1969: 652; Kim et Kim, 1972a: 84.

Maladera (*M.*) *fusania*; Stebnicka, 1980: 255.

Maladera fusania; Kim et Lee, 1991: 67; Kim, Lee, and Jeon, 1991: 169; Kim et Park, 1991: 192.

Korean name. 부산우단풍뎅이 (6 rep. after Kor. Zool. Soc., 1968).

Examined specimens (165exs.). KW: Mt. Ch'iak, Mt. Sŏrak, Samch'ŏk, Ch'unch'ŏn-C, Hongch'ŏn-K, KS: Mt. Ch'ŏnma, Mt. Kwanak, Mt. Yongmun, Mt. Soyo, Mt. Tobong, Suwon, Kwangnŭng, Yongin, Kwangju-K, Ongjin-K, P'och'ŏn-K, Kapyŭng-K, Namhansansŏng, Namyangju-K, Seoul-C, CB: Mt. Worak, Ch'ŏngju, CN: Mt. Kwangdŏk, Mt. Kyeryong, Ch'ŏnan-K, Choch'iwŏn, JB: Mt. Naejang, Mt.

Tŏkyu, Kunsan, Puan, JN: Kwangju-C., Kwangyang, Mokp'o, Changsŏng-K, Wando-K, KB: Mt. Chuwang, Mt. Hwanghak, Taegu, KN: Mt. Chiri, Chinju-C.

Monthly collection. 165exs. III: 1, IV: 11, V: 47, VI: 70, VII: 28, VIII: 4, IX: 3, X: 1ex.

Distribution. Korea (North, Central, South), Taiwan.

Maladera gibbiventris **(Brenske, 1897)** 주름배우단풍뎅이

Autoserica gibbiventris Brenske, 1897, Berl. Ent. Zeit., XLII; 396, 401; Niijima et Kinoshita, 1927: 9; Maruta, 1929: 367.

Aserca gibbiventris; Murayama, 1935a: 3; Murayama, 1938a: 12; Miwa et Chûjô, 1939: 56; Nakayama et Okamoto, 1940: 198; Cho, 1957: 124.

Serica gibbiventris; Murayama, 1954: 36; Cho, 1969: 652; Kim et Kim, 1974: 107; Kim et Nam, 1982: 154.

Maladera (M.) gibbiventris; Stebnicka, 1980: 254.

Maladera gibbiventris; Kim et Lee, 1991: 67; Kim, 1992: 105; Kim et al., 1994: 111.

Korean name. 주름배우단풍뎅이 (7 rep. after Kor. Zool. Soc., 1968).

Examined specimens (82exs.). PB: Mt. Myohang, PP: Pyŏngyang, KW: Mt. Kŭmgang, Mt. Ch'iak, Kangnŭng, Tonghae-C, Hongch'ŏn-K, KS: Mt. Ch'ŏnma, Mt. Aengmubong, Mt. Wangbang, Mt. Puram, Mt. Kwanak, Hanam-C, P'ochŏn, Namhansansŏng, Koyang-K, Namyangju-K, Kap'yŏng, Seoul-C, CB: Koesan-K, CN: Mt. Kwangdŏk, Buyŏ, Mallip'o, JB: Mt. Naejang, Mt. Tŏkyu, JN: Mt. Chiri, Changsŏng, KB: Mt. Chuwang, Kyŏngsan, Ch'ŏngdo-K, Kimch'ŏn, KN: Chinju-C, Sanch'ŏng-K, T'ongyŏng-K, Kŏje-K.

Monthly collection. 82exs. IV: 4, V: 42, VI: 23, VII: 6, VIII: 2, IX: 4, X: 1ex.

Distribution. Korea (North, Central, South), Taiwan, Central China.

Maladera okamotoi **(Murayama, 1938)** 오카모토우단풍뎅이

Aserica okamotoi Murayana, 1938, Annot. Zool. Japon, 17(1): 18.

Serica okamotoi; Murayama, 1954: 35; Cho, 1969: 651; Kim et Kim, 1974: 229.

Maladera (M.) okamotoi; Stebnicka, 1980: 258.

Maladera okamotoi; Kim et Lee, 1991: 67; Kim, 1992: 105; Kim et al., 1995: 171.

Korean name. 오카모토(도)우단풍뎅이 (4 rep. after Cho., 1969)

Examined specimens (63exs.). PP: Mt. Myohang, Pyŏngyang, ?: Mt. Tshonbon, KW: Mt. Kŭmgang, Mt. Sŏrak, Hongch'ŏn, Tonghae-C, KS: Mt. Aengmubong, Mt. Ch'ŏnma, Mt. Wangbang, Mt. Tobong, Poch'ŏn, Namhansansŏng, Suwon, Is. Kanghwa, Sŏngbuk-Ku, CB: Ch'ŏngju, Ch'ungju, Okch'ŏn, CN: Asan-K, Mt. Kwangdŏk, Choch'iwŏn, JB: Mt. Tŏkyu, Mt. Naejang, Namwon, JN: Mt. Chiri, Changsŏng-K, KB: Mt. Hwanghak, Mt. Chuwang, Ch'ŏngdo-K, Kimch'ŏn, Andong, Yŏngju, KN: Chinju-C, Tongyŏng-K, Kosŏng-K, Kŏje-K.

Monthly collection. 63exs. IV: 1, V: 21, VI: 28, VII: 8, VIII: 2, IX: 3exs.

Distribution. Korea (North, Central, South), China, Manchuria.

Remarks. The aedeagus of this species illustrated by Stebnicka (1980) differs from original description.

Maladera castanea (Arrow, 1913) 밤색우단풍뎅이

Autoserica castanea Arrow, 1913, Ann. Mag. Nat. Hist., 8(12): 398; Cho, 1967: 198.

Aserica castanea; Murayama, 1935a: 3 (Sariwŏn, Mt. Kŭmgang, Kwangnŭng, Kyŏngsŏng, Suwon, Namwon, Choch'iwŏn, Mt. Paekyang, Chejudo); Murayama, 1937: 33 (Koryŏng, Yŏngju, Chŏnju, Mokp'o, Temp. Sŏgwangsa); Miwa et Chûjô, 1939: 55; Cho, 1947: 65; Cho, 1957: 124.

Serica castanea; Murayama, 1954: 64 (Suwon, 17. IV. 1929, 1 ♂, 6. IX. 1929, 1 ♂; Mt. Kŭmgang, 12. VIII. 1937, 1 ♂).

Serica castanae [*sic*]; Cho, 1969: 654.

Maladera (*M.*) *castanea*; Stebnicka, 1980: 253(Wŏnsan, 1. IX. 1966, 19ex; Sunan, 21. VIII. 1971; Pyŏngyang; Sunch'ŏn, 27. VIII. 1971).

Maladera castanea; Nam et Kim, 1982: 129; Kim, 1983: 83; Kim et Lee, 1991: 67; Shin et Joo, 1977: 88; Yoon et Nam, 1980: 149; Kim et al., 1985: 105; Park et al., 1993: 178; Lee et als., 1994: 147.

Korean name. 밤색별우단풍덩이 (Cho, 1947), 밤색우단풍뎅이 (10 rep. after Cho, 1969), 붉은우단풍뎅(덩)이 (2 rep. after Cho, 1967)

Distribution. Korea (the whole country), Japan, Taiwan, China, Russia, North America.

Remarks. Specimens of this species in faunae since 1970's have been misidentified for *M. verticalis*.

Maladera verticalis (Fairmaire, 1888) 빨간색우단풍뎅이

Serica verticalis Fairmaire, 1888, Rev. d'Ent., VII: 118; Murayama, 1954: 59; Cho, 1969: 659; Kim et Kim, 1974: 107; Kim et Nam, 1982: 155; Kim, 1981: 344.

Aserica verticalis; Murayama, 1935a: 3; Murayama, 1938a: 14; Murayama, 1941: 20; Cho, 1957: 125.

Maladera (*M.*) *verticalis*; Stebnicka, 1980: 207.

Maladera verticalis; Kim et al., 1991: 179; Kim et Lee, 1991: 67; Kim, Lee, and Jeon, 1991: 169; Kim et Park, 1991: 192; Kim, 1992: 105; Kim, 1992: 153; Kim, 1995: 174.

Korean name. 좀빨간우단풍뎅이 (1 rep. after Kor. Zool. Soc., 1968), 좀빨간풍뎅이 (Kim et Nam, 1982), 빨간색우단풍뎅이 (6 rep. after Cho, 1969).

Examined specimens (206exs.). PP: Pyŏnyang, Moranbong, Mt. Myohyang, HH: Sariwŏn, Haeju, KW: Mt. Kŭmgang, Wonju, Hongch'ŏn-K, Mt. Sŏrak, Mt. Bangtae, Taebaek-C, Yanggu, Ch'unch'ŏn-C, Chŏngsŏn-K, Kosŏng-K, KS: Kesŏng, Mt. Myŏngji, Mt. Surak, Mt. Yongmun, Mt. Soyo, Mt. Tobong, Is. Taech'ŏng, Is. Paenyŏng, Is. Chawol, Is. Tŏkchŏk, Kwangju-K, P'och'ŏn, Kwangnŭng, Suwon,

Inch'ŏn, Puch'ŏn, Namhansansŏng, Namyangju-K, Seoul-C, CB: Mt. Songni, Mt. Worak, Ch'ŏngju, CN: Mt. Kwangdŏk, Mt. Chilgap, Mt. Kyeryong, Poryŏng-K, Puyŏ, Choch'iwŏn, Ch'ŏnan-C, JB: Mt. Naejang, JN: Mt. Paekyang, Mokp'o, Mt. Paekun, Kwangyang-K, KB: Yŏngju, Andong-K, Ponghwa-K, Mt. Chuwang, Taegu, Ulchin-K, Kyŏngsan-C, KN: Mt. Chiri, Hapch'ŏn, Chinju-C, Kŏje-K, Hamyang-K, Sanch'ŏng-K, Hadong, Miryang, Samch'ŏnp'o, CJ: Mt. Halla, Pukcheju-K.

Monthly collection. 206exs. IV: 2, V: 11, VI: 16, VII: 101, VIII: 64, IX: 1, X: 1ex.

Larvae. Sun et Zhang (1982).

Distribution. Korea (the whole country), Manchuria, Mongolia.

***Maladera ovatula* Fairmaire, 1891 다색우단풍뎅이**

Autoserica ovatula Fairmaire, 1891, Ann. Soc. Ent. Belg., XXXV, Compt. Rend.: 195; Miwa et Chûjô, 1939: 57; Murayama, 1938a: 14; Murayama, 1941: 20; Cho, 1957: 297; Park et Han, 1992: 138.

Autoserica ovatula; Niijima et Kinoshita, 1927: 5.

Serica ovatula; Murayama, 1954: 64; Cho, 1969: 660; Kim et Kim, 1974: 108; Kim et Nam, 1982: 155.

Maladera (M.) ovatula; Stebnicka, 1980: 207.

Maladera ovatula; Kim, 1981: 344; Kim et Lee, 1989: 176; Kim et Lee, 1991: 67; Kim, 1992: 104; Kim et al., 1994: 111.

Korean name. 다색우단풍뎅이 (9 rep. after Kor. Zool. Soc., 1968).

Examined specimens (110exs.). PP: Pyŏngyang, HH: Sariwŏn, KW: Mt. Kŭmgang, Mt. Sŏrak, Ch'unch'ŏn, Chŏngsŏn-K, Kosŏng-K, KS: P'och'ŏn, Koyang-K, Kwangju-K, Sŏngnam-C, Ongjin-K, Mt. Ch'ungn-yŏng, Mt. Ch'ŏnggye, Namyangju-K, Seoul-C, CN: Mt. Kwangdŏk, Mt. Kyeryong, JN: Mt. Paekun, Is. Anma, KN: Mt. Chiri.

Monthly collection. 104exs. V: 1, VI: 2, VII: 15, VIII: 84, IX: 1, X: 1ex.

Distribution. Korea (North, Central, South), Japan, Taiwan, China, Manchuria.

Remarks. This species was induced to UV light trap and collected at sand dune of seacoast, occasionally.

***Maladera aureola* (Murayama, 1938) 금색우단풍뎅이**

Aserica aureola Murayama, 1938, Annot. Zool. Jap., 17(1): 19.

Serica aureola; Murayama, 1954: 64; Cho, 1969: 661; Kim et Nam, 1982: 155.

Maladera (M.) aureola; Stebnicka, 1980: 207.

Maladera aureola; Kim et Lee, 1991: 61.

Korean name. 금색우단풍뎅이 (2 rep. after Cho, 1969).

Examined specimens (9exs.). KW: Tonghae-C, KS: Is. Kanghwa, KN: Hapch'ŏn Haeinsa, Chinju-C.

Distribution. Korea (Central, South), Taiwan.

Maladera opaciventris (Moser, 1915) 아래검은우단풍뎅이

Autoserica opaciventris Moser, 1915, Deut. Ent. Zeit.: 355 (Seoul); Niijima et Kinoshita, 1923: 29.
Aserica opaciventris; Winkler, 1925: 1071; Murayama, 1938a: 12; Miwa et Chûjô, 1939: 57; Cho, 1957: 297.
Serica opaciventris; Murayama, 1954: 26 (Yŏngju, 25. VII. 1936, 1♀); Cho, 1969: 649; Kim et Kim, 1972a: 83 (Muju Guch'ŏndong, 1. X. 1972); Kim et Nam, 1982: 154.
Maladera (M.) opaciventris; Stebnicka, 1980: 207.
Maladera opaciventris; Kim et Yoo, 1987: 505.
Serica opaeiventris; Lee et al., 1994: 147.

Korean name. 아래검은우단풍뎅이 (4 rep. after Kor. Zool. Soc., 1968), 아래점은우단풍뎅이 [*sic*] (Lee et als., 1994).

Distribution. Korea (South).

Remarks. Specimens of this species in several faunae since 1970's were misidentified for *M. orientalis* and *Sericania fuscolineata*.

Eight *Maladera* species previously recorded mistakenly from Korea

1. *Maladera japonica* (Mot.) recorded in 45 literatures since Kolbe (1886) was misidentified for *M. orientalis*.

2. *Maladera koreana* (Moser) reported by Moser (1919) and Murayama (1938) could not be recognized because of specimens unavailable, and the original description is very similar to that of *M. verticalis*. By these reasons, eventhough we have not examined the specimen, it is considerd to be misidentification of *verticalis*.

3. *Maladera formosae* (Brenske) recorded by Stebnicka (1980) was misidentified for *verticalis* and in 11 literatures (Niijima et Kinoshita, 1923; Murayama, 1937, 1938, 1954; Miwa et Chûjô, 1939; Cho, 1957, 1969; Kor. Zool. Soc., 1968; Nomura, 1974; Kim et Nam, 1982; Kim et Lee, 1991) were misidentified for M. *ovatula*.

4. *Maladera thibetana* (Brenske) recorded by Niijima et Kinoshita (1927) was mistaken. Their specimen had diagnostic chracters as 9-jointed antenna and wide hind femur while *thibetana* had as 10-jointed antenna and slender hind femur.

5-6. *Maladera stridula* (Brenske) and *M. laboriosa* (Brenske) recorded by Murayama (1935, 1937) could not be recognized. Because his specimens were heavy damaged not to be compared to diagnostic characters.

7. *Maladera* (*Eumaladera*) *nitidiceps* Nomura recorded by Stebnicka (1980) was mistaken because illustrated aedeagus was different from original description, so the cited list by Ent. Kor. Soc.(1994, 톱다리우단풍뎅이) was invalid.

8. *Maladera kamiyai* Sawada recorded by Kim et Chang (1987) was misidentified for *Serica brunnea* Linnaeus.

DISCUSSION

Three species (*M. motschulskyi, M. spissigrada*, and *M. nakayamai*) out of 26 recorded as Korean species were already revised as synonym of *M. renardi* by Nomura (1967) and other 8 revealed as misidentified species. Accordingly actual Korean *Maladera* is 15 species.

Considering the literatures we think *Maladera opaciventris* is closer to genus *Serica* than *Maladera*, but we place tentatively to the genus *Maladera* in this paper. A further study is needed with the examination of specimens.

M. holosericea complex that has closed end and symmetrical parameres is distributed from Europe to Japan in Palaearctic Region. *M. orientalis* complex, that has right paramere which is more longer than left one and opened end, is distributed in Manchurian Subregion and also in Taiwan. *M. verticalis* complex that has upper and lower paramere is distributed in Manchurian Subregion and North America. Therefore, one branch in *holosericea* complex that considered original group of the genus *Maladera* looks like *orientalis* complex that dispersed to Oriental Region and other branch looks like *verticalis* complex that dispersed to the Nearctic region. And the subgenus *Eumaladera* distributed mainly in Japan and Taiwan, has not been found in Korea, and seems to be medium type between *M. orientalis* complex and *M. verticalis* complex. So we expect that some of *orientalis* complex have been dispersed through Japan to the Nearctic Region as subgenus *Eumaladera*.

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韓國産 우단풍뎅이亞科의 分類學的 硏究. II, 알모양우단풍뎅이屬

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韓國産 알모양우단풍뎅이屬 (검정풍뎅이科, 우단풍뎅이亞科)에 대하여 분류학적인 검토를 실시하였다. 지금까지 한국산으로 보고된 23種 중, 8種은 異同定에 의하여 기록된 것으로서 실제적인 한국산은 15種뿐이나 이중에서도 2종은 한국분포가 의심된다. 확정된 한국산중 다음과 같은 9종은 3개의 complex로 간주한다.

M. holosericea complex: *M. holosericea, M. schoenfeldti, M. renardi*

M. orientalis complex: *M. cariniceps, M. orientalis, M. fusania*

M. verticalis complex: *M. castanea, M. verticalis, M. ovatula*

검색어 : 딱정벌레目, 검정풍뎅이科, 알모양우단풍뎅이屬, 韓國, 分類

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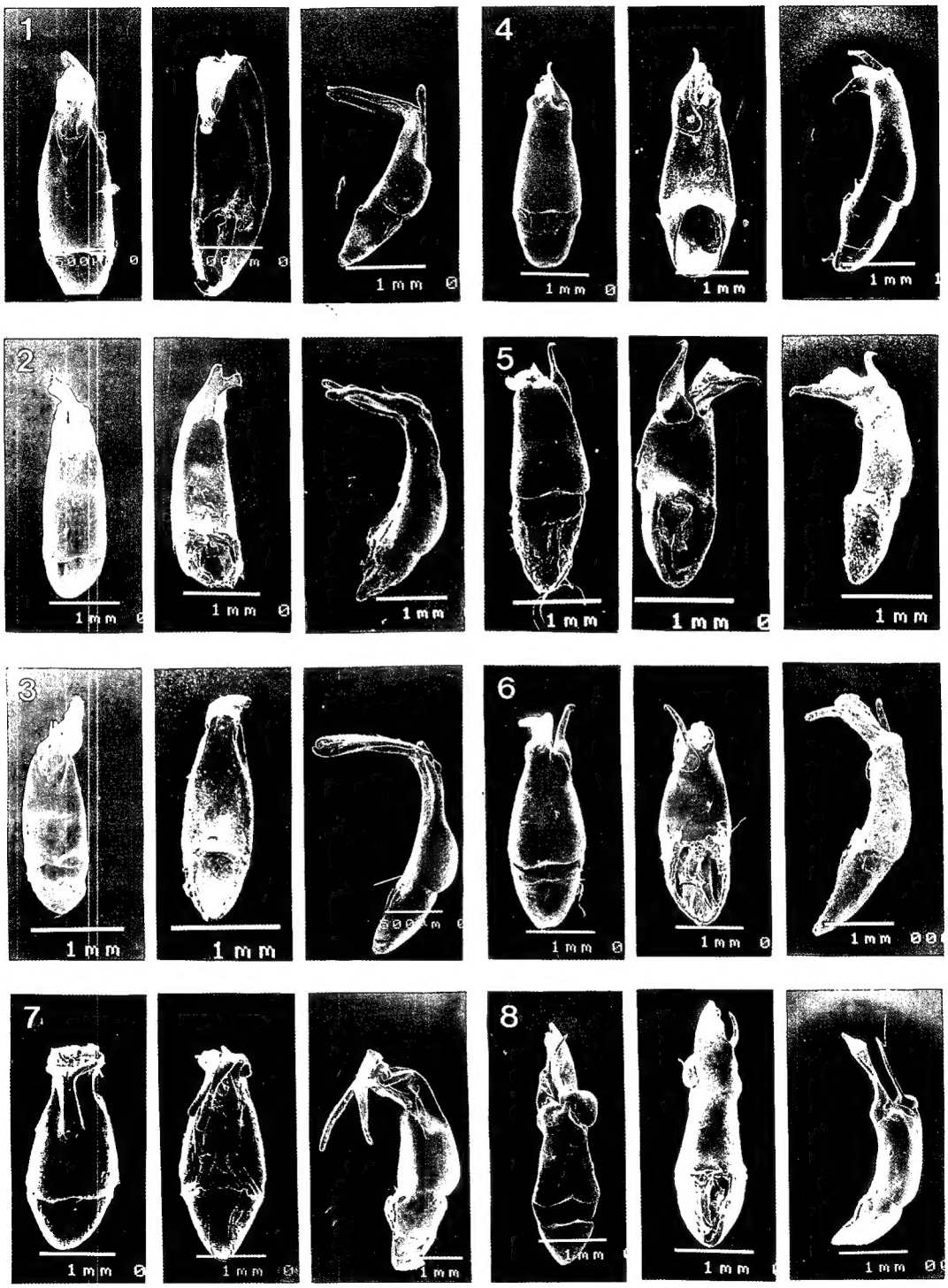
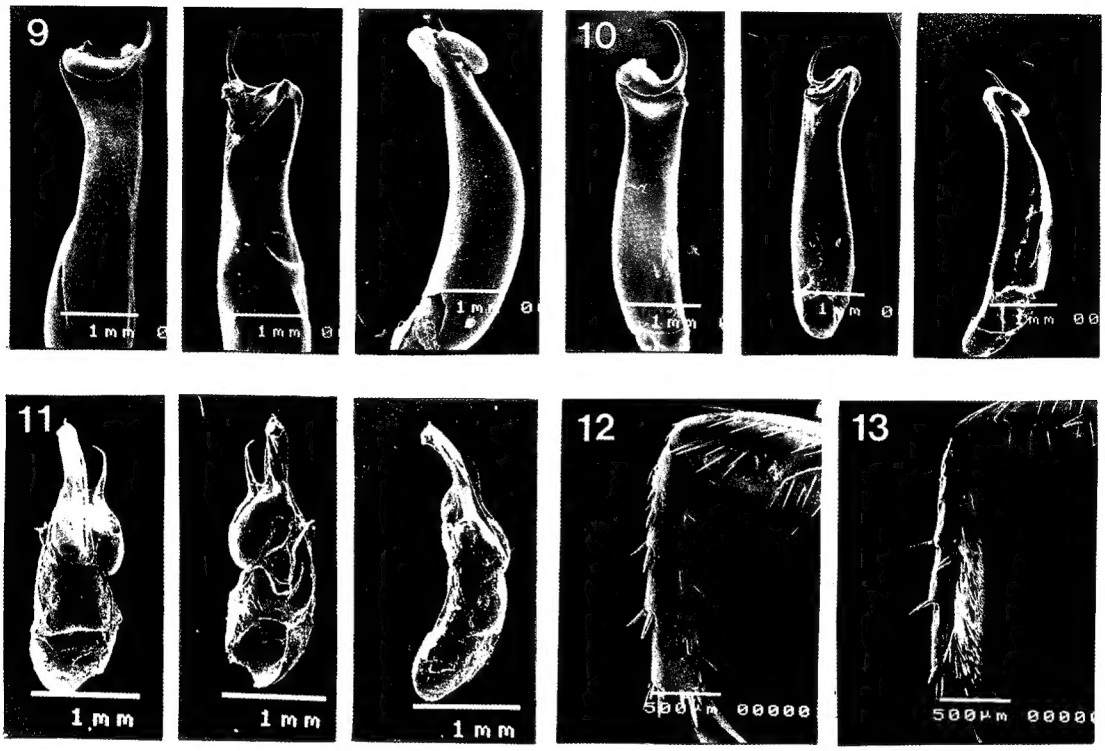


Figs 1-8. Male aedeagus of *Maladera* (dorsal, ventral, and lateral view). 1. *M. holosericea* (Scopoli); 2. *M. schoenfeldti* (Murayama); 3. *M. renardi* (Ballion); 4. *M. cariniceps* (Moser); 5. *M. orientalis* (Motschulsky); 6. *M. fusania* (Murayama); 7. *M. gibbiventris* (Brenske); 8. *M. okamotoi* (Murayama).



Figs. 9-11. Male aedeagus of *Maladera* (dorsal, ventral, and lateral view). 9. *M. verticalis* (Fairmaire); 10. *M. ovatula* (Fairmaire); 11. *M. aureola* (Murayama).

Figs. 12-13. Male mid tibia of *Maladera*.
12. *M. orientalis* (Motschulsky); 13. *M. aureola* (Murayama).